Shell Answer Book #1

THE EARLY WARNING BOOK

How you can spot some car problems before they cost big money

By Russ Russo, Shell Car Care Expert

Come to Shell for answers

Save this guide. If you use it to check your car regularly, you might prevent a dangerous or expensive problem.

I asked 150 drivers in the parking lot of a shopping center to do all the car checks in this guide. *Two out of three* of them found something that could have become a dangerous

Here I am helping one of our volunteers check under the hood. Two out of three drivers who tried my car check found something that could have become a dangerous or expensive problem.

or expensive problem if left alone. Things like worn out tires, tattered belts, low motor oil.

In fact, almost everyone in the test found *something* that needed attention.

Q. Are my brakes unsafe?

A. You don't have to be a mechanic to make this simple check.

Push the pedal down. If it goes more than halfway to the floor, that's too far. The pedal should feel like it's hitting something hard. If it feels spongy you might have air bubbles in the brake lines.

Next, push down hard and count to ten. If the pedal keeps going down, you could have master cylinder troubles. (For power brakes, the engine has to be running during this check.)

Check the parking brake this way. Set it firmly. If the car moves easily in "drive' or "first," your brake flunks.

If you find anything suspicious about the brakes, take it to an expert, pronto.

Q. What do those driveway drips mean?

A. Maybe nothing. Maybe a big problem.

To check them out, spread some paper under your car overnight. That'll make the new drips stand out. Use the photograph at right to diagnose what the drips are. Clear condensed water from the air-conditioner is okay. But if anything else is dripping, it could be that your car is trying to tell you something. If you have trouble telling exactly what

About the author

A.J. (Russ) Russo has been with Shell since 1948. A Project Supervisor in the Field Services Division at Shell's head office in Houston, Texas, Russ has done considerable research on state safety inspections. He contributed to guidelines for Periodic Motor Vehicle Inspection which were adopted by the American Petroleum Institute. Russ is a past board chairman of the Car Care Council and member of the board of the Certified Auto Repairmen's Society.

I prepared this paper to show what various stains might look like under your car.

the problem is, ask an expert. (**Warning:** Never put paper under a car that's running or has a hot exhaust.)

Q. How do I learn under-the-hood geography?

A. One key to troubleshooting potential problems is just knowing where to look.

For example, if you mean to check your coolant overflow tank, and check your windshield washer tank instead, you might set yourself up for an overheated engine.

So if you're not an expert in under-the-hood geography, ask a friend who knows about cars. Like your Shell Dealer.

(**Warning:** Make sure the engine is off for all under-the-hood checks.)

Q. Where in the world is the power steering pump?!

A. It's pretty hard to spot. So a lot of people just forget about it. But it is important.

The pump, with its reservoir, is usually on the driver's side with a drive belt connecting it to the engine.

Once you find it, wipe the dirt off the reservoir cap and filler neck. Then take the cap off and check the level with the built-in dipstick. Notice that it shows different levels for hot and cold.

Q. How much motor oil is enough?

A. Motor oil is the lifeblood of your engine. Not checking it would be like

a doctor's not taking your pulse at a physical exam.

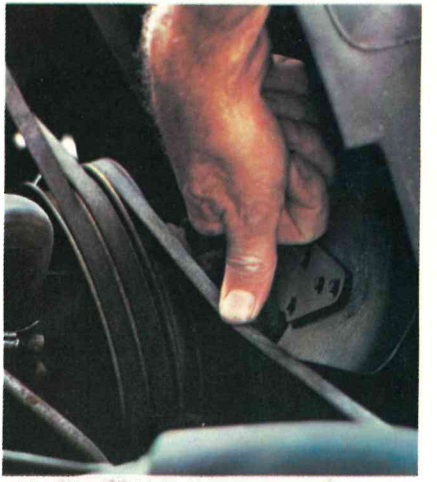
Pull the dipstick out, wipe it clean, put it all the way back in, then pull it out again. The oil level should be between the "ADD" mark and the "FULL" mark.

Q. What's the fan belt rule of thumb?

A. I learned this easy test years ago. To check tension, press your thumb down on the middle of each belt the way I'm doing in the picture at right. It shouldn't give more than about half an inch.

Look for fraying and cracks, too. Twist belts around to inspect underneath.

The fan, water pump, alternator, power steering, air-conditioner, and emission-control air pump all have belts to drive them.



The belt shouldn't give more than about half an inch when you press hard.

Q. Any early warnings from the battery?

A. Many a road service bill might have been avoided with these two simple checks.

First, check the battery fluid level. **Warning: Don't smoke during this check. Batteries can give off explosive hydrogen.**

Take the caps off and make sure the acid solution inside comes up to the bottom of the filler neck. When it's at the right level, the fluid touches

Check the Shell line for the right motor oil for your car

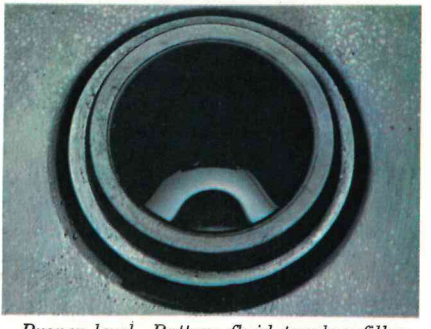
Shell X-100® single grades are available in SAE 10W, 20W/20, 30 and 40. Each meets the warranty service requirements of every U.S. car and most foreign cars.

Shell X-100® Multigrade is an SAE 10W-40 all-season oil offering excellent high-temperature protection plus good low-temperature startability. Exceeds warranty requirements.

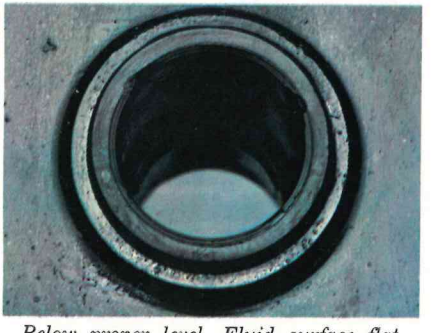
Shell Super X® earns the 10W-50 rating, the widest multigrade range you can buy; for even greater high-temperature protection than our 10W-40. Exceeds warranty requirements.

the filler neck and "puckers" a little as shown below. If it's too low, add water.

Next, check your battery cables. Make sure they're tight and aren't frayed. Light-colored powdery stuff on the terminals is corrosion and should be cleaned off.



Proper level. Battery fluid touches filler neck and "puckers" a little.



Below proper level. Fluid surface flat, doesn't reach filler neck.

Q. Is it safe to check the radiator?

A. Not always. The hot, pressurized coolant could gush out and scald you. Don't remove the cap unless the engine is cold.

You can check the coolant level **without** removing the cap if your car has a coolant overflow tank. (See photograph above.) Notice that there are different levels for hot and cold engines.

If your car has no overflow tank, and the engine is cold, go ahead and

Put your car through this checklist

- ☐ 1. Dashboard warning lights.
- ☐ 2. Horn.
- ☐ 3. Windshield washers and wipers.
- ☐ 4. Parking brake.
- ☐ 5. Brakes. Does pedal go more than halfway to floor? Is it spongy? Does it continue to sink under pressure?
- ☐ 6. All outside lights.
- ☐ 7. Motor oil level.
- ☐ 8. Windshield washer fluid.
- ☐ 9. Power steering fluid level.
- ☐ 10. Belt condition and tension.
- ☐ 11. Battery fluid level.
- ☐ 12. Battery cable condition.
- ☐ 13. Coolant level in radiator.
- ☐ 14. Radiator and heater hoses.
- ☐ 15. Tire pressure.
- ☐ 16. Tire wear. (Are wear indicators showing? Is wear uneven?)
- ☐ 17. Shock absorber action.
- ☐ 18. Stains from leaking fluids.

If your car has an overflow tank, check engine coolant level there.

remove the radiator cap. A level an inch below the bottom of the filler neck is about right.

Check the top and bottom radiator hoses for cracks and bulges. Check for leaks at the connections. Do the same for heater hoses since they carry engine coolant, too.

Preventive maintenance idea: Some car makers recommend changing your radiator and heater hoses every two years. I do too.

Q. Checking tire pressure is a pain. Why bother?

A. Here's why. A tire that's only 25 percent low — hardly enough to see — can lose *one-fifth* of its useful life. On top of that, underinflated tires waste gasoline.

Checking pressure is *free*. I do it about once a month.

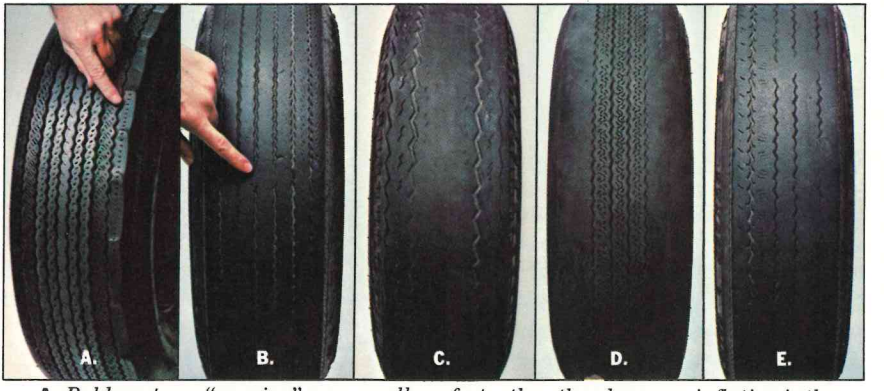
Radial tire owners: The "radial bulge" can sometimes disguise a tire that really is underinflated. Don't rely on looks. Use a gauge.

Shell Radial Ride.™

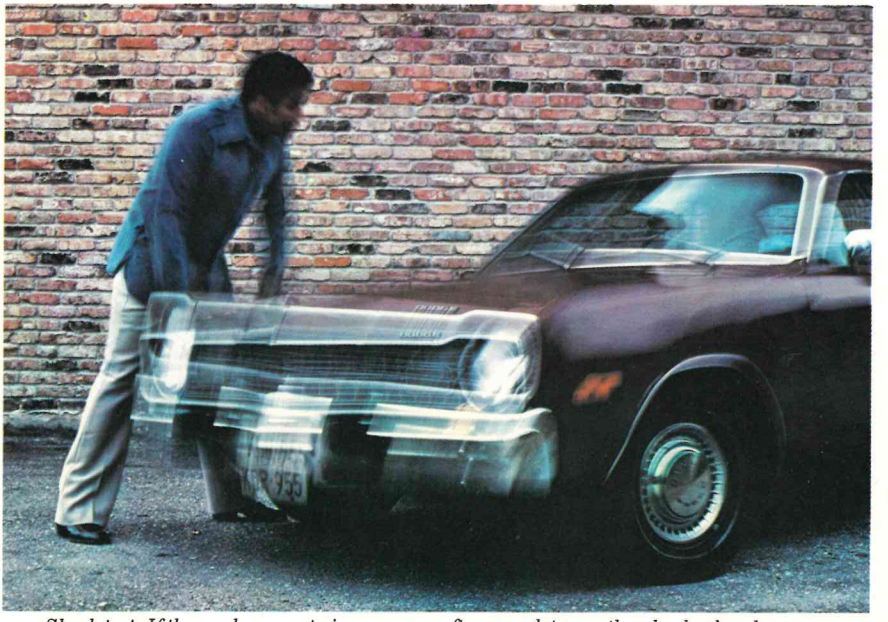
Our economy radial. Two belts of fiberglass cord, two polyester cord body plies. For the driver who wants the handling and steering response of radials, without paying for the added strength and mileage of steel.

Q. When does a worn tire become a dangerous tire?

A. Look for the tread wear indicators that show up when your tread gets down to the last 1/16 inch. When they show across two or more grooves (as in photo), that can be dangerous. When a tire of mine gets that worn, I get rid of it.



A. *Bald spots or "cupping" are usually caused by out-of-balance wheels or weak shocks.* **B.** *Tread wear indicator showing across two or more grooves means tire should be replaced. It's the law in most states.* **C.** *If the center of the tread wears faster than the edges, overinflation is the cause.* **D.** *When the edges wear faster than the center, it's probably due to underinflation or hard cornering.* **E.** *Wheel misalignment can cause one edge of the tread to wear faster.*



Shock test: If the car bounces twice or more after you let go, the shock absorbers are weak. Replace them.

Q. Are my shock absorbers doing their job?

A. If your shocks are more than 15,000 miles old, do this check.

Bounce the car up and down hard at each wheel. Once it's going good, let go and see how many times it bounces. Good healthy shocks will stop it after one. Weak shocks that bounce twice or more will give you unnecessary tire wear and maybe even handling problems.

Q. Won't most problems be obvious?

A. No. You can overlook things that are practically under your nose. There are several things to check right from the driver's seat.

1. Do your dashboard warning lights work? They should all light up when the engine is cranking and the parking brake is on. Common warning lights: alternator, brakes, temperature, oil pressure. Check your owner's manual if you're not sure which ones your car should have.

2. Does your horn honk? Easy to check. Bad to wait til you need it to make sure it works.

3. Windshield washers and wipers. Do they spray right? Do they wipe clean?

4. What about outside lights? Get a helper to check headlights (high and low), emergency flashers, side markers, parking lights, license plate lights, taillights, brake lights, backup lights (shift to reverse), and turn signals. (Most cars need the key on for the last two.)

Unleaded users. If your car acts like it needs a tune-up, try Shell Super Regular Unleaded first.

Does your car:
Stall out? — the engine dies one or more times before it warms up.
Knock? — a pinging, rattling noise when going uphill or accelerating.
Run on? — you turn off the key but the engine keeps chugging on.

These problems aren't uncommon in cars designed for unleaded gasoline. But before you spend money for a tune-up to try and solve any of them, try a tankful of Shell Super Regular Unleaded.

Shell Super Regular Unleaded is blended to fight stallout. And its higher octane rating (94 or 95 Research octane number instead of about 92 for the average unleaded) can eliminate engine knock and run-on in a lot of cars.

Why spend money for a tune-up if all you need is the right gasoline? Try Shell Super Regular Unleaded first.
(Super Regular Unleaded is available at most Shell stations.)

Q. Any questions?
A. Write me.

I can't give you mechanic's advice from afar, but I'll try to answer any questions about how you can spot early warnings of car trouble. Write Russ Russo, Shell Oil Company, P.O. Box 61609, Houston, Texas 77208.

Watch for Shell Answer Books on other subjects in leading magazines and at participating Shell Dealers.

©1976 Shell Oil Company

Come to Shell for answers

Shell Answer Book #2

THE BREAKDOWN BOOK

A Shell survival manual for car trouble on the road

By Sandra Bundy, of Shell's Engineering Staff

Come to Shell for answers

Keep this book in your glove compartment.
It can show you what to do if you have a breakdown.
And maybe how to avoid one in the first place.

When I set out to write this book I was determined to do more than just report statistics. Breakdowns don't happen to statistics, they happen to people.

So for two days I rode with the California Highway Patrol to get a firsthand look at car breakdowns on the road.

One thing I learned is that no driver can be *sure* he won't break down. So here are some good things to know if you have trouble on the highway.

Q. What's the first thing to do if my car breaks down?

A. Get it out of the way. That sounds elementary, but too many drivers stop right in the middle of the road when they don't have to. Then raise your hood and turn on your emergency flashers. Tie a handkerchief or a piece of white cloth to your antenna or door handle.

If you *have* to stop in the roadway and you have warning flares with you, put one 10 feet in

This is the right way to do it. Other drivers know immediately that you need help.

back of your car. And another 300 feet to the rear. Then put a third flare about 100 feet in front of your car.

Note: Be careful not to put flares anywhere near spilled gasoline.

Don't leave your car on the road. And don't walk away unless you know where you're going. Getting lost won't help.

Q. Should I leave my car to get help?

A. It really depends on where the breakdown happens. If you're in a familiar neighborhood, and you *know* help is nearby, go for assistance.

Otherwise, it's best to lock your doors and stay in your car until help arrives. The raised hood, flashing lights and white handkerchief will tell people you need help.

If other motorists do stop, roll down your window just enough to ask them to call for help. If they're really sincere, they'll do it. If they aren't, they'll still be locked out.

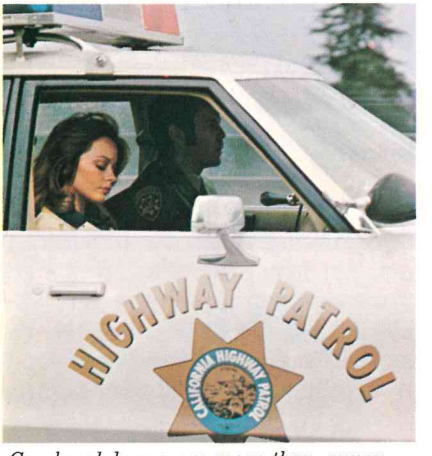
Q. What could I carry in my car that would really help in emergency breakdowns?

A. Some things you should never be without: a working flashlight, simple tools, warning flares or reflectors, jack, lug wrench. A fire extinguisher is also a good idea.

Q. What's the safest way to change a tire on a busy highway?

A. Get your car as far off the road as you can. And make sure you allow for plenty of room to work. It doesn't help to get your car out of the way if *you* wind up changing the tire on the road.

If you happen to be on a road or freeway where it's impossible to get out of the way, keep driving with flashers on. Ruining the tire or even the wheel is better than taking a chance of being hit by a moving car.



Car breakdowns are more than annoyances. They're a real danger. In 1974 more than 1,400 Americans were killed or injured while pushing or working on a car in the roadway.

Q. I've never had to change a flat tire. How do I do it?

A. First, check your owner's manual. It should show you exactly what to do to change a tire on *your* car. But generally, here are nine basic steps to follow:

1 Park on level and solid ground. If you have an automatic transmission, put the car in "park." If not, put it in gear. And always put your emergency brake on. You should also block the wheel on the opposite corner of the car to keep it from rolling. A piece of wood or large stone will do.

2 Take the wheel cover off. Usually you can use a screwdriver or the tapered end of the lug wrench to pop it off.

3 Take the lug wrench and loosen each lug nut one turn.

4 Take the spare tire out first, it's easier and it's safer. Then place the jack on solid ground and jack up the car. (Follow owner's manual instructions.)

When you finish, the tire should be at least two or three inches off the ground.

5 Remove the lug nuts. (Put them in the wheel cover so you won't lose them.) Then pull off the flat tire.

6 Put the spare tire on and tighten each lug nut snugly, being careful not to jar the car off the jack. Jack the car down until the tire is just touching the ground. Then finish tightening the nuts.

[7] Tighten the lug nuts as tight as you can. Don't tighten them in circle sequence. That could cause the wheel to come loose as you drive. Tighten one, then the one opposite it, and so on. Finish lowering the car.

[8] Don't put the wheel cover back on. Put it in your trunk. Every time you see the wheel without it, you'll be reminded to get that flat fixed.

[9] Put your jack, tools and flat tire back in the trunk.

You're ready to travel again. But get that flat fixed right away. Driving without a spare tire is asking for trouble.

Q. If my engine starts to sputter, is that a sign that a breakdown is on the way?

A. Probably. It's likely that you're running out of gas. Don't get stuck in the middle of the road. Check your gauge. If you are out, get off the road as safely and as quickly as you can. This young woman ran out of gas. But she didn't lose her head. Here she's calling for assistance. Some states have call boxes located along major freeways or roads. If you break down near one, use it. But remember, before you call, make sure you know approximately where you are, so that you can tell someone how to reach you.

Safety Tips:

Whenever you stop for gas, take a minute and wipe the road dirt from your headlights as well as your windshield. Dirty headlights reduce your vision and make night driving dangerous.

Carry both your automobile insurance card and driver's license when traveling. Keep them in your wallet or purse, not in your car. If someone breaks in and finds them, you could hear from him again.

If walking at night, stay well off the road, and tie on a white armband.

Q. What should I do if my engine starts to overheat?

A. Some people think that driving faster will blow more air into the engine and cool it. *It won't.* If your warning light shows that your engine is overheating, pull safely off the road and turn your engine off. Then see if you can spot the trouble. If you can you'll be one step ahead when someone stops to help.

Q. The alternator light comes on. Should I stop and turn my engine off?

A. No. If you do, you may not get started again. Whenever possible keep driving until you can pull into a garage or service station. But keep your eye on the temperature and oil pressure gauges as you go.

This man said he thought his transmission was about to go out. So he pulled over to check the transmission fluid level. NOTE: After you've checked your engine, don't stay in front of the car. It's unnecessary, and more importantly, it's dangerous.

Q. Do I have to stop if the oil pressure light comes on?

A. Absolutely. And turn off the engine. Check the oil level with the dipstick. You'll probably find the oil doesn't even show up. *Don't* drive your car until you've added oil. If you do, you could ruin your engine.

Shell motor oils protect your engine in hot weather and cold.

Shell X-100® Multigrade is an SAE 10W-40 all-season motor oil offering excellent high-temperature protection plus good low-temperature startability.

Shell Super X® earns the 10W-50 rating, the widest multigrade range you can buy, for even greater high-temperature performance than our 10W-40.

Q. What are the key things to check to help avoid a breakdown?

A. 1. **Tires.** Correct air pressure isn't enough. You should also check for signs of wear. If you're down to your last 1/16 inch of tread you'll be able to see the tread wear indicators. If they show across two or more grooves, get a new tire before you leave. And be sure you have a good spare tire. Plus, everything you need to change a flat.

2. **Motor Oil.** Motor oil is the lifeblood of your car. Not checking it would be like a doctor's not taking your pulse. So check the dipstick to make sure your oil is between the "ADD" and "FULL" marks.

These people had a flat. But that's not why they're stuck. They didn't have a jack to change it with. Make sure you have all the equipment you need.

These Shell tires are built tough to fight road hazards and last long.

Super Shell® Steel Belted Radial Tire. Shell's best. Twin belts of steel cord, plus two radial plies of polyester cord, for the tire mileage and steering response radial construction offers.

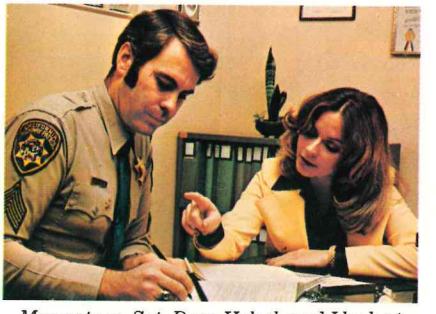
Shell Radial Ride.™ Two belts of fiberglass cord, two polyester cord body plies. You get the handling and steering response that radials offer without paying for the added strength and mileage of steel.

3. Belts. Press down on each one with your thumb. They shouldn't give more than about half an inch. Also check to see if they are frayed or cracked. If they are, replace them.

4. Battery. Look to see that it has enough fluid. If it's low, add water. And make sure the battery cables are tightly connected and free of corrosion.

5. Cooling System. Eyeball the condition of the radiator hoses and their connections for leaks, cracks and swelling. Have the condition of the coolant checked by an experienced professional.

6. Brakes. Push the pedal down. If it goes more than halfway to the floor, that's too far. Push down again and count to ten. If the pedal keeps going down and down, you could have master cylinder trouble. (With power brakes, the engine must be on for this test.)



My partner, Sgt. Dave Helsel, and I look at some alarming figures. During 1975, in California alone, the Highway Patrol came to the aid of over 800,000 disabled vehicles. I wonder how many of those could have avoided trouble by simply checking a few things in advance?

Breakdown Prevention Checklist

- ☐ Instrument panel warning lights
- ☐ Tires
- ☐ Windshield wipers and washers
- ☐ Motor oil
- ☐ Outside lights
- ☐ Brakes
- ☐ Power steering fluid
- ☐ Belts
- ☐ Battery
- ☐ Radiator
- ☐ Hoses
- ☐ Horn
- ☐ Emergency flashers
- ☐ Spare tire and changing equip.
- ☐ Safety flares or reflectors

With today's reliance on self-serve, it's more important than ever to keep your car in good shape. This checklist can help.

Q. What causes most breakdowns today?

A. I found it's still the basic problems like: flat tires, overheating, running out of gas.

Most breakdowns don't have to happen. A neglected car invites trouble.

Give your car the attention it needs by visiting your Shell Dealer regularly.

Q. Any questions?

A. Write me.

If you've still got some unanswered questions about car breakdowns, let me know. What I learned through my own research and what I learned on the highway just might help you avoid one. Write Sandra Bundy, Shell Oil Company, P.O. Box 61609, Houston, Texas 77208.

Watch for Shell Answer Books on other subjects in leading magazines and at your participating Shell Dealer.

©1976 Shell Oil Company

About the author

Sandra Bundy is a graduate of Texas Tech University with a degree in petroleum engineering. She is a member of the Society of Petroleum Engineers and works at Shell Oil Company's headquarters in Houston, Texas. Yes, like most drivers, she's had car breakdowns herself. She even admits to running out of gas. Once.

Shell wishes to thank the California Highway Patrol for their assistance in the preparation of this book. This is in no way an endorsement of Shell products by the California Highway Patrol.

Come to Shell for answers

Shell Answer Book #3

THE GASOLINE MILEAGE BOOK

How to save gasoline when you buy a car, drive a car, and take care of a car

By Dave Berry, Shell Mileage Expert

Come to Shell for answers

Save this book. It shows proven ways to save gasoline money without driving less.

Last summer I got 23 ordinary drivers and one ordinary car to do an unusual demonstration. The idea was to show how good car maintenance and informed driving techniques can *really* save gasoline.

The results were impressive.

Everybody saved gas. On the average, our drivers went 23.5 percent farther on a gallon. And I think a lot of drivers could do that well.

Ask yourself the questions in this book. See if you don't find some new ways to squeeze more miles from a gallon of gasoline.

Q. Is my car sabotaged?

A. Hard to say. But from the results of part one of my test, I think a lot of cars are.

Each of the test drivers ran a 22-mile city and country course in a car that I had carefully *sabotaged* with mileage handicaps.

- The ignition timing was set back five degrees.

Here I am with some of the drivers in my three-part mileage test. The mileage maintenance we did between parts one and two increased mileage 14.6 percent. In part three they raised it another 8.9 percent by just using good mileage driving tricks.

For part one, I sabotaged our test car with some typical mileage handicaps. Since the mileage we got wasn't unusually low, I think a lot of cars must have handicaps like these. How about yours?

• The engine was idling a little too rich and too fast.

• I'd put on bias-ply tires instead of radials.

• The tires were five pounds underinflated, hardly enough to notice.

• The wheels were just a hair out of alignment.

• Finally, I had filled the crankcase with 30-weight motor oil instead of better-mileage 10W-40.

With all these handicaps, the 23 drivers still averaged 13.6 mpg in this first part of the test. Since that's not unusually low for a car of this make and year, I figure a lot of cars must have handicaps just as bad as the ones I put into our test car.

Three basic ways to become a mileage miser

Buy your car carefully. Our tests showed the "mileage cost" of optional equipment. See page 5.

Take good care of your car. Proper engine tune, tire pressure, and wheel alignment, plus radial tires and multigrade motor oil boosted mileage 14.6 percent in my test. See page 3.

Drive right. By accelerating gently, anticipating stops, and watching speed, we gained another 8.9 percent. See page 4.

Q. What's good mileage maintenance worth?

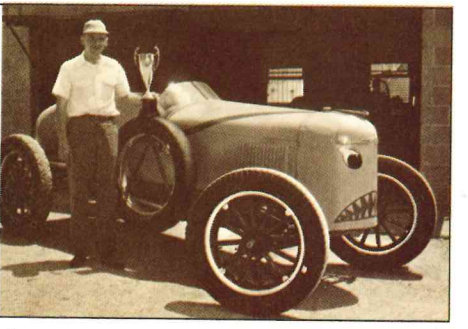
A. It paid off in a big way in part two of our test. A 14.6 percent mileage improvement.

Between parts one and two we switched from bias-ply to steel-belted radial tires. And I inflated them to the proper pressure. Those two changes by themselves probably improved gas mileage about seven percent.

Correcting ignition timing prob-

About the author

Dave Berry is in Shell's Oil Products Research and Development Department. His work there includes studies of fuel and vehicle performance. Dave has collected several firsts in the "Mileage Marathon" organized by Shell lab employees. His best score was 168.47 mpg in a highly modified 1924 Chevrolet (photo). His contest experience was the basis for his Society of Automotive Engineers paper, "Nine Ways to Get Better Fuel Mileage."



ably accounted for another five percent. Fixing the idle speed, correcting the wheel alignment, and switching to all-season 10W-40 oil combined to push us up to the total of 14.6 percent.

Q. Tune-ups are expensive. Are they worth it?

A. In addition to the performance advantages of a tune-up, you might get a mileage payoff. Figure it this way. If your engine is badly out of tune, it could waste five percent of its gas. For an average driver, that would add up to 35 gallons a year.

These days, the value of that much gasoline would pay back a big chunk of the tune-up cost.

Q. Can driving tricks really save gas?

A. In part three, I told our test drivers these four driving tricks. And they improved their mileage another 8.9 percent.

1. Accelerate gently. You don't have to creep away from a stop. Just take it easy.

2. Anticipate stops. Take your foot off the gas and let the car coast up to the intersection. (Keep it in gear, though, for safety.)

3. Don't go too fast *or* too slow. Most cars get their best mileage around 35 mph. In our test, we

After each driver's turn, I sneaked a look at the precision fuel-measuring equipment I had installed in the trunk. It showed an average mileage improvement of 14.6 percent due to mileage maintenance alone.

The Shell Radial Ride™ might cost you less than bias-ply in the long run

The Shell Radial Ride is an economy radial tire. Although it's more expensive than most bias-plies, the difference in cost might be a good investment for you. Because driving on radials can save you money.

First of all, they'll probably wear much longer than bias-ply tires under equal conditions. That lowers their cost per mile. A radial tire that costs twice as much as a bias-ply is really no more expensive if it lasts twice as long.

In addition, the Shell Radial Ride, because of its radial construction, will give you better gas mileage than most bias-ply tires. That saves you money every mile.

Think about investing in Shell Radial Ride tires for your car. They might actually cost you less than bias-plies in the long run. And you'll be getting the good handling of radials as an added benefit.

didn't go over 50 on the freeway.

4. Get into high gear quickly. If you have an automatic, lift your foot off the accelerator to make it shift earlier.

Q. Am I supposed to creep around at a snail's pace?

A. Of course not. My test group averaged 33 minutes to cover the 22-mile course in the first two runs — *before* I explained the above mileage tips to them. The last run — with the mileage tips — took only six minutes longer.

Q. What's the "mileage price" of optional equipment?

A. It's the gas to run it and carry its extra weight throughout the life of your car. The chart on page 7 shows the expected effect of some options.

To demonstrate how they can add up, we got two new intermediate-sized cars, same make and model. One was equipped to be a gas miser: 6-cylinder engine, gas-saver thermostatic fan, economy rear axle, stick shift. The other car, while not really a big gas guzzler, had some fuel-eating options — like air conditioning, power steering, V-8 engine, automatic transmission. We drove the two cars for 1,083 miles each, including 260 miles of in-town driving.

In stop-and-go traffic, you can save a lot of gas by doing two simple things. Accelerate gently when you leave a stop. When you see a stop coming, take your foot off the gas and coast up. It doesn't cost you a lot of time.

The final score: With options —16.3 mpg. Without options—23.0 mpg.

Based on a price of 58¢ per gallon, the extra gasoline to drive the

Before part three, I gave each driver a quick course in gas stretching. My good mileage driving tricks helped the test group go 8.9 percent farther.

loaded car the way we did for 10,000 miles would cost $104.

The exact mileage penalty caused by such optional equipment depends on the type of driving; the make, model, and condition of the car; the weather; and other factors. This demonstration shows only a general effect. It can't be used to predict performance in other cases. The gasoline price in the example is the approximate national average price for unleaded as of April 12, 1976, calculated from published industry data.

Q. What's the best way to save gas?

A. Don't drive unnecessarily.

Carpool. Use public transportation. For short trips, bicycles and feet get you there for nothing. Conserving energy is still important. And nothing chops the gas bill like leaving the car in the driveway.

We hired some college students to drive our 1,000-mile test to find the "mileage price" of new car optional equipment. They switched cars every few hours so that differences in the way they drove wouldn't affect results.

Q. How much difference will the size of my new car make?

A. The annual savings you gain with a good mileage small car might be something you want to consider

How a friend of mine drove his way into the Guinness Book of World Records

The best automobile gas mileage ever recorded is 376.59 mpg. My friend Ben Visser did it in a "Mileage Marathon" organized by Shell lab employees.

Ben's car was an all-out mileage monster that wouldn't even be safe for normal driving. The top speed (when not coasting) was about 12 mph, and the car lacked a few niceties like window glass, springs, and a generator. Nevertheless, you can use some of Ben's principles to save gas in your automobile.

A warm engine is more efficient. Ben wrapped his engine in layers of insulation to hold heat in. You can take advantage of engine heat by grouping short trips together so the engine doesn't cool down in between.

Reduce rolling resistance. Ben used high-pressure airplane tires. You can use radial tires and keep them inflated to the pressure recommended in your owner's manual.

Use low gears sparingly. Ben took his transmission out and replaced it with a chain drive. You can help by getting into higher gears as soon as you can.

Cut engine drag. Ben did it by installing loose bearings in the engine. You can do it by using 10W-40 motor oil instead of a 30-weight. The multigrade will flow more freely and cut drag while the engine is warming up.

when deciding how big a car to buy. This chart shows the approximate *relative* mileage of 1976 cars of different sizes. These are estimates based mainly on the EPA combined city/highway data for U.S. cars.

MILEAGE GROUP	SIZE	CYLINDERS	TRANS-MISSION	AIR-CON-DITIONER	APPROX. MPG PENALTY	ADDED GAS COST FOR 10,000 MI.
1	MINICOMPACT	4	MANUAL	NO	0	0
2	MINICOMPACT	4	MANUAL	YES	2.5	$15
	MINICOMPACT	4	AUTOMATIC	NO		
3	MINICOMPACT	4	AUTOMATIC	YES	5	$32
	SUBCOMPACT	4	MANUAL	NO		
4	SUBCOMPACT	4	MANUAL	YES	7	$49
	SUBCOMPACT	4	AUTOMATIC	NO		
5	SUBCOMPACT	4	AUTOMATIC	YES	9.5	$74
	SUBCOMPACT	6	MANUAL	NO		
	COMPACT	6	MANUAL	NO		
6	SUBCOMPACT	6	MANUAL	YES	10.5	$85
	SUBCOMPACT	6	AUTOMATIC	NO		
	COMPACT	6	MANUAL	YES		
	INTERMEDIATE	6	MANUAL	NO		
7	SUBCOMPACT	6	AUTOMATIC	YES	12	$104
	COMPACT	6	AUTOMATIC	NO		
	INTERMEDIATE	6	MANUAL	YES		
8	COMPACT	6	AUTOMATIC	YES	13	$119
	COMPACT	8	MANUAL	NO		
	INTERMEDIATE	6	AUTOMATIC	NO		
9	COMPACT	8	MANUAL	YES	14	$135
	COMPACT	8	AUTOMATIC	NO		
	INTERMEDIATE	6	AUTOMATIC	YES		
	INTERMEDIATE	8	MANUAL	NO		
10	COMPACT	8	AUTOMATIC	YES	15	$153
	INTERMEDIATE	8	MANUAL	YES		
11	INTERMEDIATE	8	AUTOMATIC	NO	17	$196
	FULL	8	AUTOMATIC	NO		
12	INTERMEDIATE	8	AUTOMATIC	YES	18	$222
	FULL	8	AUTOMATIC	YES		
13	LUXURY	8	AUTOMATIC	YES	19	$251

How to Read. *This chart shows differences in average mileage between thirteen groups of cars. Group one gets the best mileage. Column six shows how much less mileage other groups get. Column seven shows the cost of the additional gasoline that a car in one of those groups would need for 10,000 miles of driving.*

For example, *a car in group seven will get about 12 mpg less than a car in group one. And use about $104 worth of additional gasoline in 10,000 miles. The same car will get about 3 mpg more than a car in group 10, and by comparison would save about $49 worth of gasoline ($153 minus $104) in 10,000 miles of driving. These calculations used a national average price of 58¢ per gallon for unleaded gasoline derived from published industry price data for April 1976.*

Q. Any questions?

A. Write me.

I'll be happy to tell you more details about our tests or answer questions on how you might be able to stretch gasoline. Just write Dave Berry, Shell Oil Company, P. O. Box 61609, Houston, Texas 77208.

THE EARLY WARNING BOOK
THE BREAKDOWN BOOK
THE GASOLINE MILEAGE BOOK
THE CAR BUYING & SELLING BOOK
THE 100,000 MILE BOOK
THE RUSH HOUR BOOK
THE DRIVING EMERGENCY BOOK

How to get more answers from Shell. *Get these books in the Shell Answer Series. The Early Warning Book, The Breakdown Book, The Gasoline Mileage Book, The Car Buying and Selling Book, The 100,000 Mile Book, The Rush Hour Book, The Driving Emergency Book. They're available at many Shell Dealers. Or write Shell Answer Books, P.O. Box 61609, Houston, Texas 77208. Books on new subjects will be out soon.*

©1977 Shell Oil Company

Come to Shell for answers